Comments on Safety & Security Research

Bob Kelley-Wickemeyer

Safety/Security for Commercial Aircraft

- **The goal for all of us should be:**
  - **"Provide an affordable safe haven for the traveling public regardless how hostile the world"**
- **We have achieved this for historical causes of accidents for large commercial transports.**
  - Today, you are more likely to die of natural causes on an airplane trip in the US as you are from an accident.
  - After the 2002 CAST Approved Plan is implemented in 2007, you will be 100 times more likely to die of natural causes
- **Large commercial aircraft accident prevention research has graduated to addressing likely future risks.**
- **The learnings from CAST:**
  - **System of systems approach with all stakeholders involved**
  - **Much more leverage from preventing an accident than mitigating the consequences.**

Defensive Systems for Commercial Aircraft

- **The air transportation system is now faced with an evolving and potentially extreme security threat environment.**
- **System-of-systems assessments are required to understand total system (airplane, airport, airspace, etc.) requirements and R&D needs to deal with potential emerging security threats.**
  - Need to concentrate efforts on neutralizing security threats before we spend any effort on mitigating the consequences of a security threat.
  - Need to address security while maintaining passenger confidence and still achieve improvements in safety, capacity, ease of travel and cost.
- **Protection strategies and technology solutions must consider cost and operational feasibility, as well as unintended consequences.**
- **Technology can be leveraged from military programs. However, military hardware is not optimized or necessarily the best solution for commercial aircraft in civilian operations.**

Very Complex Aviation Security Threat Environment

Perpetrator

Pan Am 103 December 21, 1988	al Qaida Attack September 11, 2001	Arkia Airlines - Mombassa November 28, 2002

- Terrorist - plans to inflict
- Political - wants to leave
- Criminal - needs to esca ransom.
- Civilian - air rage, alcohol problems, mental illness. Disrupt flight.

Some possible "threat vectors" - there are many others

Scenarios/Threats

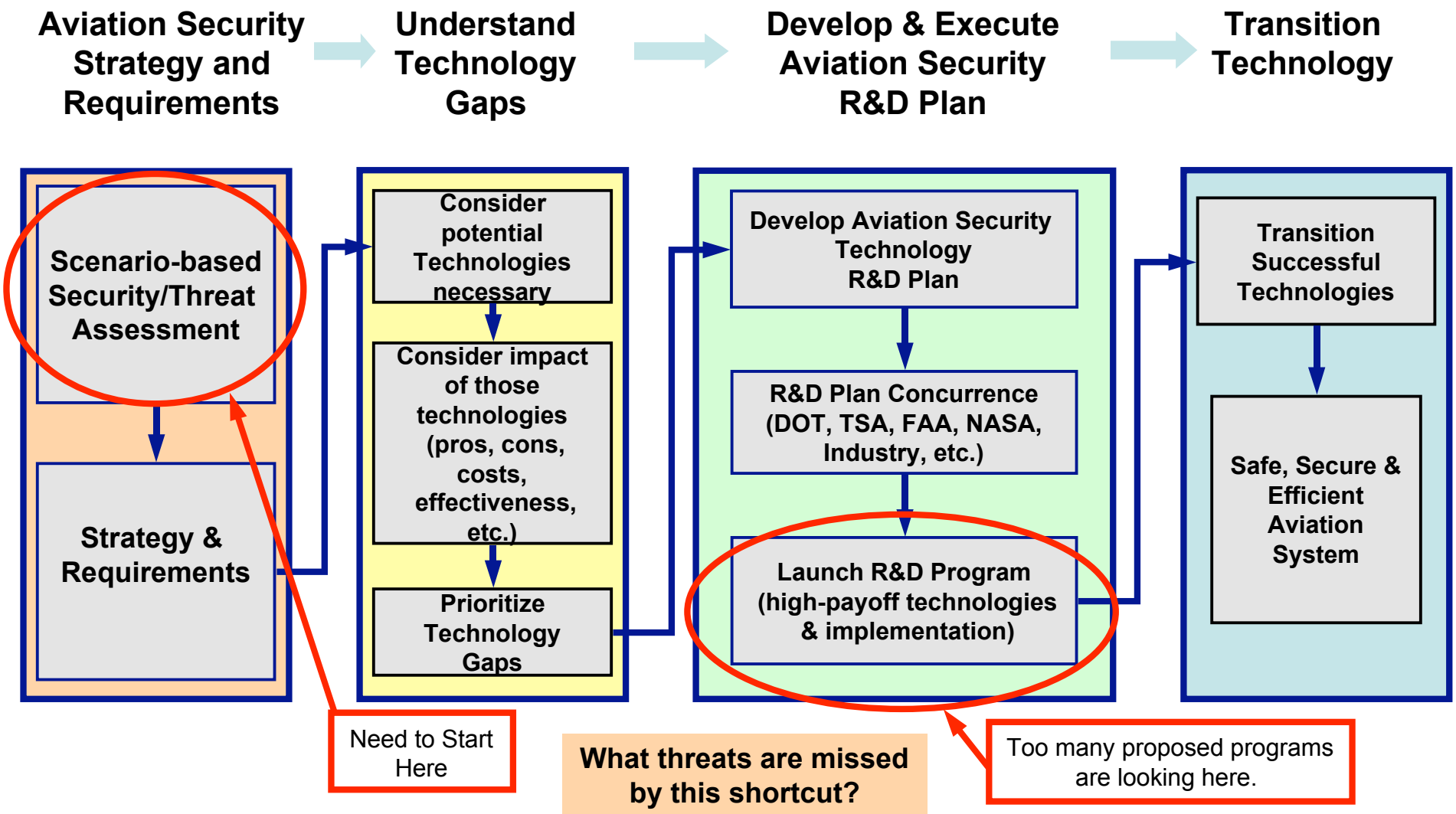
- Small arms, guns, knives, etc.
- Grenades, Incendiary devices
- Bombs, Improvised Explosive Devices
- Chemical/Biological Weapons, Lasers
- Cyber Attack
- Air Space Disruption
- Missiles, rockets, mortars, EMI/EMP
- Intimidation
- Use of aircraft as a weapon

Modes of Introduction

- Passengers, and carry-on bags
- Checked bags and interline bags
- Cargo, mail, courier items
- Flight crew (pilots, flight attendants, etc)
- Service (cleaners, ramp, fuel, maint, etc.)
- Off-board (missiles, jammers, etc.)
- Air Traffic Center or Infrastructure
- Internet

Aviation Security risk mitigation is complex; multiple solutions are needed

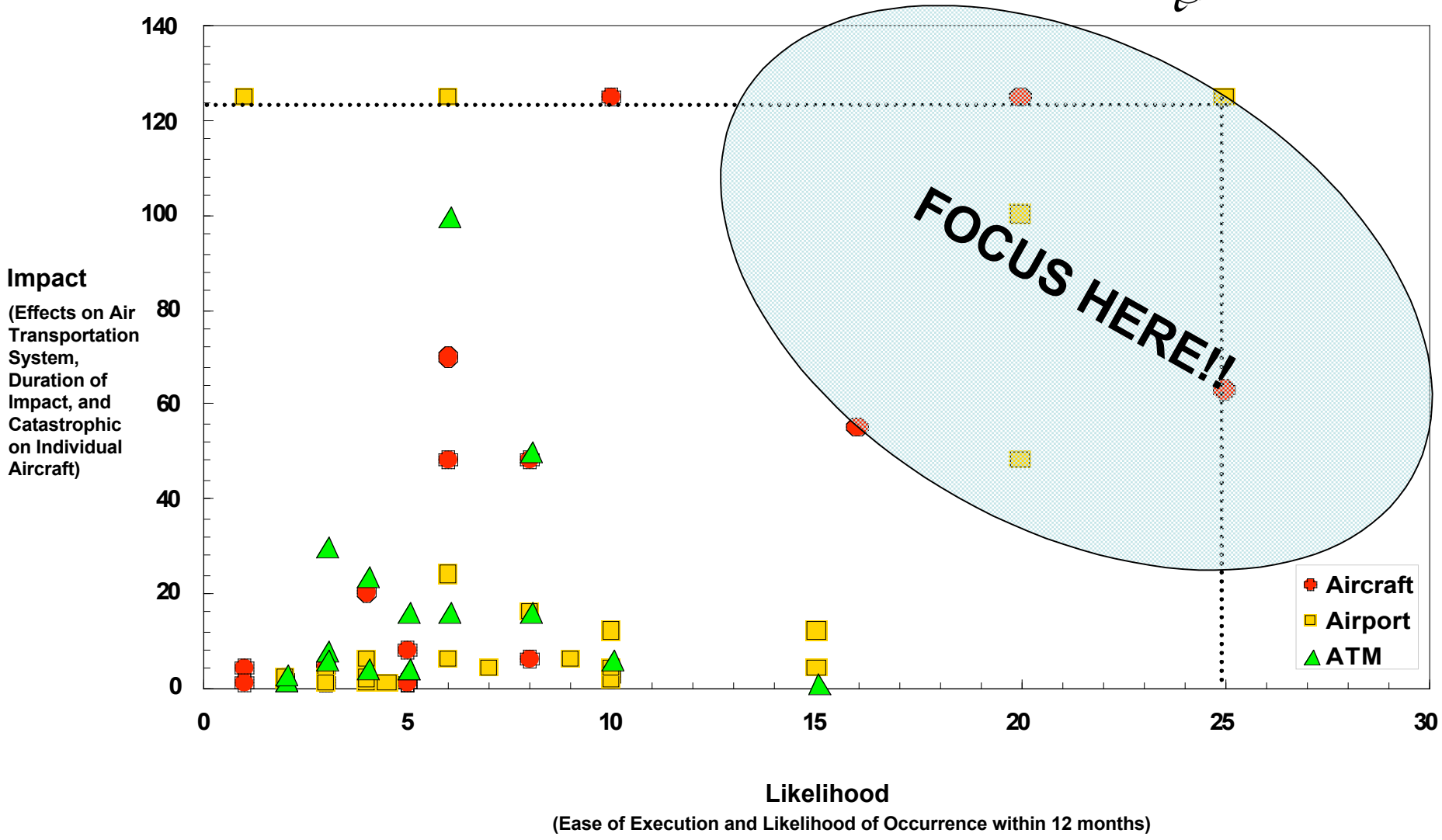
Systems Engineering Process
Applied to Aviation Security R&D Planning



Prioritization of Threat Risk
- Aircraft, Airport, ATM -

Preliminary

BOEING



Defensive Systems for Commercial Aircraft

Key Points

- **On-board infrared countermeasures (IRCM) have been proposed to protect commercial aircraft from hand-held missile threats. However, on-board IRCM systems were not designed for commercial platforms and are not necessarily the best solution.**

- **Hand-held missiles are one of many threats that could be used against commercial aircraft. This is not necessarily the most likely or greatest impact threat. A system-of-systems threat assessment needs to be performed to determine the greatest threat risks.**